SEMESTER END EXAMINATION APRIL-MAY, 2026

Course Name: B.Tech. **Semester: IV**

Paper Name: Discrete Mathematics **Paper Code: NAD 401**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark**. **All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.
- Calculator is allowed for this paper.

Section - A
Multiple Choice Questions

1. Answer all the following questions. **5x3 =15**

i) Which of the following is not countable?
   a) The set of all integers
   b) The set of all rational numbers
   c) The set of all irrational numbers
   d) The set of all finite subsets of N

ii) A graph has 12 vertices, two vertices of degree 3, two vertices degree 4 and and other vertices degree 5. The number vertices are
   a) 4
   b) 6
   c) 8
   d) 10

iii) If $(Z_5, +)=\{0,1,2,3,4\}$ is a finite abelian group then 3+4 is
   a) 7
   b) 3
   c) 2
   d) 1

iv) Which of the following is a proposition
   a) What is your name?
   b) Please close the door
   c) 5+2=10
   d) This statement is false

v) The generating function corresponding to the sequence {1,2,3,...r+1,...} is
   a) 1/x
   b) 1/(1-x)
   c) $1/(1-x)^2$
   d) None of the above

Section - B
Short Answer Questions

2. Answer any five of the following questions. **5x7=35**

i. Define countable and uncountable sets. Show that the set of integers is countable and set of real numbers is uncountable.

ii. **a)** Let R be the relation on set on a set A = {1,2,3,4,5} whose matrix is given below. Draw its directed graph.

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 1 & 1 \end{bmatrix}$$

b) Write down the truth table of $(p\,q) + r \cong (p + r)(q + r)$

iii. Find the Domain and range of the function $f(x) = \frac{1}{\sqrt{(1-x)(x-2)}}$ and $\sqrt{x^2 - 9}$.

iv. Show that the 4, 4th roots of unity form an abelian group with respect to the multiplication.

v. Define Normal subgroup. Show that a subgroup H of a group G is Normal in G iff $g^{-1}H_g = H, \forall\, g \in G$.

vi. Define Homomorphism and Isomorphism with examples.

vii. Prove that there are (n-1) edges in a tree with n vertices.

Section – C
Descriptive Questions

3. Answer any two of the following question. **2x10=20**

i) Define subgroup and Cosets. State and prove Lagrange's theorem

ii) Discuss about Logic gates and digital circuit.

iii) Define Group. Show the n, nth roots of unity form an abelian group with respect to multiplication.

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